NAVAL POSTGRADUATE SCHOOL
MONTEREY, CALIFORNIA

THESIS

AN EVALUATION OF THE HUMAN RESOURCE DEVELOPMENT PROCESS SUPPORTING CASS

by

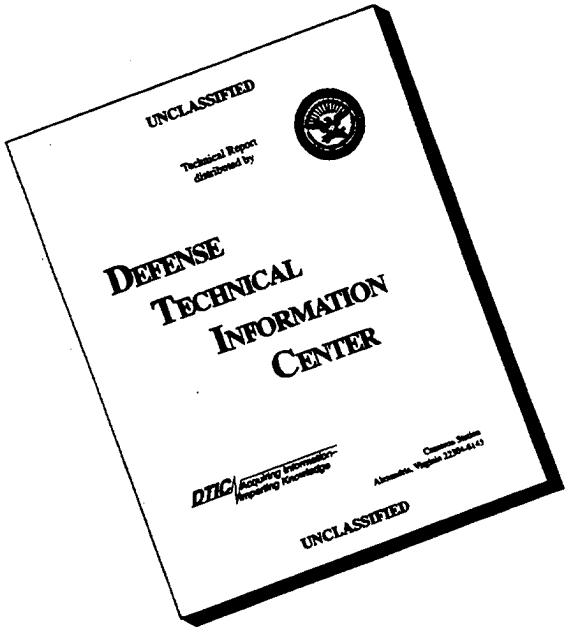
George F. Kilian

December, 1995

Principal Advisor: Paul J. Fields
Associate Advisor: Kevin R. Gue

Approved for public release; distribution is unlimited.

DISCLAIMER NOTICE



THIS DOCUMENT IS BEST QUALITY AVAILABLE. THE COPY FURNISHED TO DTIC CONTAINED A SIGNIFICANT NUMBER OF PAGES WHICH DO NOT REPRODUCE LEGIBLY.

REPORT DOCUMENTATION PAGE

Form Approved OMB No. 0704-0188

1. AGENCY USE ONLY *(Leave blank)*	2. REPORT DATE December 1995	3. REPORT TYPE AND DATES COVERED Master's Thesis

4. TITLE AND SUBTITLE AN EVALUATION OF THE HUMAN RESOURCE DEVELOPMENT PROCESS SUPPORTING CASS

5. FUNDING NUMBERS

6. AUTHOR(S) Kilian, George, F.

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
Naval Postgraduate School
Monterey CA 93943-5000

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government.

12a. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution is unlimited.

12b. DISTRIBUTION CODE

13. ABSTRACT *(maximum 200 words)*

This thesis is an evaluation of the human resource development process supporting the Consolidated Automated Support System (CASS). The CASS Implementation Plan and related Navy Training Plan are established to deliver CASS hardware/software and a trained workforce to the fleet for system operation and maintenance throughout its life cycle. This study involves an overview of both plans, a definition of basic personnel development requirements for any weapons system, a review of historical ATE training deficiencies, and the current status of CASS technician training at the Naval Aviation Maintenance Training Group Detachments (NAMTRAGRUDETs). Its conclusions are that the plans collectively address the elements essential to develop a skilled workforce to support CASS throughout its life cycle. However, delivery delays of CASS Station hardware, Test Program Sets (TPSs), and a representative sample of various aircraft Weapons Repairable Assemblies (WRAs) and Shop Replaceable Assemblies (SRAs) pose problems that must be resolved before training can satisfy the majority of acquisition, fleet maintenance, and training management desires.

14. SUBJECT TERMS CASS Training; ATE Training; CASS Navy Training Plan; CASS Implementation

15. NUMBER OF PAGES 72

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified	Unclassified	UL

NSN 7540-01-280-5500 Standard Form 298 (Rev. 2-89)
Prescribed by ANSI Std. 239-18 298-102

Approved for public release; distribution is unlimited.

AN EVALUATION OF THE HUMAN RESOURCE DEVELOPMENT PROCESS SUPPORTING CASS

George F. Kilian
Lieutenant Commander, United States Navy
B.A., Eastern Washington State College, 1973

Submitted in partial fulfillment
of the requirements for the degree of

MASTER OF SCIENCE IN MANAGEMENT

from the

NAVAL POSTGRADUATE SCHOOL
December 1995

Author: George F. Kilian
George F. Kilian

Approved by: Paul J. Fields
Paul J. Fields, Principal Advisor

Kevin R. Gue, Associate Advisor

Reuben T. Harris
Reuben T. Harris, Chairman
Department of Systems Management

ABSTRACT

This thesis is an evaluation of the human resource development process supporting the Consolidated Automated Support System (CASS). The CASS Implementation Plan and related Navy Training Plan are established to deliver CASS hardware/software and a trained workforce to the fleet for system operation and maintenance throughout its life cycle. This study involves an overview of both plans, a definition of basic personnel development requirements for any weapons system, a review of historical ATE training deficiencies, and the current status of CASS technician training at the Naval Aviation Maintenance Training Group Detachments (NAMTRAGRUDETs). Its conclusions are that the plans collectively address the elements essential to develop a skilled workforce to support CASS throughout its life cycle. However, delivery delays of CASS Station hardware, Test Program Sets (TPSs), and a representative sample of various aircraft Weapons Repairable Assemblies (WRAs) and Shop Replaceable Assemblies (SRAs) pose problems that must be resolved before training can satisfy the majority of acquisition, fleet maintenance, and training management desires.

TABLE OF CONTENTS

I. INTRODUCTION 1
A. BACKGROUND 1
1. CASS Station Description 2
2. Navy Training Plan (NTP) 4
B. THESIS OBJECTIVES AND RESEARCH 5
C. METHODOLOGY 6
D. THESIS CHAPTER SUMMARY 6

II. CASS IMPLEMENTATION PLAN (CIP) OVERVIEW 9
A. OBJECTIVE AND COORDINATION 9
B. IMPLEMENTATION ISSUES 12
1. CASS Station Reutilization 12
2. Base Realignment And Closure (BRAC) 12
3. High Power Device Tester (HPDT) 12
C. CIP PLANNING PROCESS 12
1. Station Allocation 12
2. Test Integration Facilities (TIFs) 13
3. TPS Program Manager's Support Checklist 14
4. TPS Red Team Package 14
5. Site Activation Planning Guide (SAPG) 17
D. CASS INSTALLATION 18
1. Navy CASS Installations: Ship Alterations (SHIPALTS) and Military Construction (MILCON) 18
2. Marine Corps CASS Installations 19

III. CASS NAVY TRAINING PLAN (NTP) OVERVIEW 21
A. DEFINITION AND PURPOSE 21
B. CASS OPERATIONAL USES 21
C. EQUIPMENT/SYSTEM/SUBSYSTEM REPLACED 22
D. FUNCTIONAL DESCRIPTION: CASS STATION AND TPS 23
1. CASS Station 23
2. CASS TPS 24
E. CONCEPTS: MAINTENANCE, OPERATIONS, MANNING, TRAINING 25
1. Maintenance 25
a. Organizational Level Maintenance 25
b. Intermediate Level Maintenance 25
c. Depot Level Maintenance 26
d. Technical Assistance 26
e. Interim Maintenance 26

2. Operations 27
3. Staffing 27
a. Navy Personnel 27
b. Marine Corps Personnel 28
4. Training 28
a. Initial Training 28
b. Follow-on Training 28
c. On-Board Training (MTIP) 30
d. Other On-Board Training (MATMEP) 30

IV. TECHNICIAN TRAINING: BACKGROUND AND STATUS 31
A. PERSONNEL AND TRAINING: BASIC CONCEPTS 31
B. HISTORICAL ATE AND MANPOWER DEVELOPMENT PROBLEMS 34
C. TRAINING SITUATION ANALYSIS REPORT 36
1. Report Summary 36
2. Report Conclusions 38
D. STATUS OF CASS TRAINING AT THE NAMTRAGRUDET 40
E. EVALUATION OF TECHNICIAN TRAINING 43

V. CONCLUSIONS AND RECOMMENDATIONS 47
A. CONCLUSIONS 47
1. Primary Research Question 47
2. Subsidiary Research Questions 48
B. RECOMMENDATIONS 50
C. FOLLOW ON RESEARCH 51

APPENDIX 53

LIST OF REFERENCES 61

INITITAL DISTRIBUTION LIST 63

I. INTRODUCTION

A. BACKGROUND

The Consolidated Automated Support System (CASS), AN/USM-63, is now entering the fleet and was developed by the Naval Air Systems Command as the next generation of Automatic Test Equipment for general purpose support of aircraft electronic systems. The program addresses concerns about the growing proliferation of Automatic Test Equipment (ATE) issues and problems. These include an increasing variety of equipment lacking commonality, with no incentive to standardize, expensive site activation with a typical ten year life cycle, and virtually no support or transferable Test Program Set (TPS) capability. CASS will address these problems and provide the means to meet future requirements while minimizing the need for unique support equipment. The anticipation of budgeting constraints and force level reductions necessitates ATE consolidation. CASS provides integrated support to meet the challenges of aviation electronic readiness and serves as a platform suitable for employment in the Regional Maintenance Concept (RMC) arena. [Ref. 1]

Operation and maintenance of CASS at fleet activities will be performed by Navy and Marine Corp Aviation Electronics (AT) and Navy Electronics (ET) personnel [Ref. 2]. The Naval Aviation Training Program, as defined in OPNAVINST 1500.11, requires planning for billets, personnel, military construction, training support, and personnel training. These processes will be administered concurrent with hardware acquisition, development, and production in a manner to ensure maximum efficiency with minimal cost and personnel movement. Program policy clearly mandates developing a skilled, productive technical work force to operate and maintain CASS throughout its life cycle. The Naval Aviation

Maintenance Training Program, as defined in OPNAVINST 4790.2F, provides a detailed explanation of command responsibilities extending from the Chief of Naval Operations (CNO) to the site activity for operator and maintenance personnel training.

CASS implementation requires trained, competent technicians to transfer the current ATE workload to CASS. An accurate assessment of each installation site's workload and resulting manpower needs is essential. This defines type and number of billets, training track responsibilities, and the personnel detailing plan to fill the billets with skilled technicians.

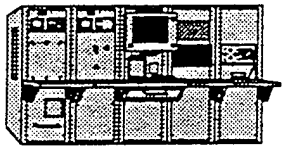
1. CASS Station Description

"CASS is a computer-assisted, multi-functional ATE system designed to fulfill all current and future automatic testing requirements of the Navy's electronic devices" [Ref. 1]. It is primarily intended for Intermediate Maintenance Activity (IMA) applications ashore, on carriers, in mobile vans, and at Naval Aviation Depots (NADEPs). Because a single tester capable of handling all conceivable requirements would be too large, CASS is modular. Depending on functional needs, CASS components/circuit cards are combined in the following four distinct station configurations (See Figure 1):

- Hybrid (HYB)
- Radio Frequency (RF)
- Communications, Navigation, and Identification (CNI)
- Electro-Optical (EO).

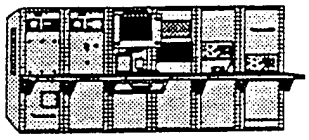
The Hybrid station is designed as the common core for the other three. All four basic configurations have 90% hardware commonality. This provides significant flexibility and

CASS CONFIGURATION



HYBRID STATION
(Basic Test Station)

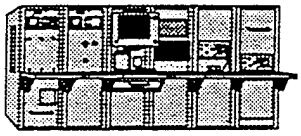
- General Purpose Electrical/Electronics
- Computers
- Instruments
- Flight Controls
- Plus Subsystems For:
  - Pneumatic
  - Display
  - Inertial Navigation



RF STATION

Basic Test Capability

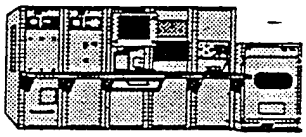
Plus
- ECM Capability
- ECCM Capability
- EW Support Measures
- Fire Control Radar
- Navigation Radar
- Tracking Radar
- Surveillance Radar
- Radar Altimeter



CNI STATION

RF Station Capability

Plus
- Communications
- Navigation
- Spread Spectrum Systems



EO STATION

Basic Test Capability

Plus
- Forward Looking Infrared (FLIR)
- Lasers/Designators
- Laser Range Finders
- Visual Systems

Figure 1. CASS Station Configurations and Capability. From Ref. [1].

means TPS developed for the hybrid station can also be run on any of the other three configurations. Ancillary devices for emerging requirements that exceed CASS core capabilities will be competitively procured as needs arise. For example, a High Power Device Tester, which will replace older and less efficient high power test ATE, is targeted for acquisition in 1995. [Ref. 1]

A fifth major configuration, the CASS Common Test System (CTS), is being developed to support the Advanced Medium Range Air to Air Missile (AMRAAM) at joint services depots. CTS is not designed to offer the TPS transfer capability of the other configurations and will be used exclusively for guided munitions testing. It will meet 80% of the testing requirements for the full spectrum of tactical guided munitions and like weapons in the Department of Defense inventory. Like the four basic configurations, it has open architecture with expansion and adaptability features for future guided munitions needs. [Ref. 1]

2. Navy Training Plan (NTP)

The CASS Navy Training Plan has been developed to define CASS lifecycle manpower, personnel, and training requirements. Aviation Electronics Technician (AT) and Electronics Technician (ET) ratings with the Navy Enlisted Classification (NEC) 6704 will operate and maintain the system. The ET rating is included as an additional source rating to acquire CASS technicians. AT and ET personnel with the NEC 6705 will perform on-line calibration and advanced maintenance. Marine Corps personnel with the Military Occupational Specialty (MOS) 6467 will both operate CASS and perform all maintenance functions. During initial system introduction additional manpower requirements are expected,

but as older ATE systems are phased out of service a significant reduction in Navy billets and Marine Corps billets is anticipated in FY97 and FY98. [Ref. 2]

Initial training for operation, maintenance, and calibration was provided by the contractor to support test and evaluation, Naval Air Maintenance Training Group Detachment (NAMTRAGRUDET) instructors, depot support personnel, and fleet cadre personnel. All initial training courses are complete and implemented. Follow-on training for NECs 6704, 6705, and MOS 6467 takes place at NAMTRAGRUDETs Oceana, and Miramar. [Ref. 2]

B. THESIS OBJECTIVES AND RESEARCH

This thesis evaluates the manpower development process supporting CASS for fleet and shore activities. Considerations are based on the number of sites planned, related work center staffing, training methodology, school house constraints, and potential future changes. A determination will be made regarding the overall effectiveness of this process. The primary research question is:

- Will the CASS Implementation Plan and related Navy Training Plan ensure personnel staffing and skills are sufficient to successfully support CASS implementation in fleet activities?

Relevant subsidiary research questions are:

- Does the NAMTRAGRUDET CASS curriculum address all equipment operation and maintenance requirements?
- Are formal training elements such as Naval Aviation Maintenance Training Group Detachment (NAMTRAGRUDET) instructor staffing, class schedules and student quotas thoroughly addressed?

- Are training hardware/software elements such as CASS Stations, Weapons Repairable Assemblies (WRAs), Shop Replaceable Assemblies (SRAs), and related Test Program Sets (TPSs) in place or available?

- Has a Maintenance Training Improvement Program (MTIP) support package been developed for fleet workcenter training?

- Will Engineering Technical Services (ETS) be available for fleet support?

C. METHODOLOGY

Research began with a review of the basic human resource development requirements essential for support of any weapon system. In addition, the CASS Implementation and Navy Training Plans were examined with an emphasis on coordination between hardware/software implementation, CASS technician training and subsequent fleet assignment.

A study of historical ATE problems and current independent research projects followed and was complemented with numerous phone conversations with subject matter experts.

Finally, the author visited the CASS site at Naval Air Station Miramar, the supporting Naval Aviation Maintenance Training Group Detachment, and the Test Integration Facility at Naval Air Station North Island.

D. THESIS CHAPTER SUMMARY

Chapter II is an overview of the CASS Implementation Plan and provides a definition of goals and current issues. It also describes the planning process established for hardware/software development and allocation to activities scheduled for CASS installations. Chapter III reviews the current CASS Navy Training Plan and defines operational uses, ATE

systems to be replaced, and various concepts relating equipment operation and technician development. Chapter IV discusses technician training in the context of generic training requirements, historical ATE problems, and current status. Chapter V presents thesis conclusions and recommendations.

II. CASS IMPLEMENTATION PLAN (CIP) OVERVIEW

This chapter is an introduction to the CASS Implementation Plan and begins with a definition of goals and current issues. The chapter also describes the planning process that determines CASS Station allocation, Test Program Set development, site installations, and concludes with a brief definition of responsibilities.

A. OBJECTIVE AND COORDINATION

The CASS Implementation plan is an ongoing effort to ensure support of emerging weapon systems requirements, the coordinated off-load of currently fielded Test Program Sets (TPSs) to CASS, and retirement of obsolete ATE . It provides detailed CASS and TPS delivery schedules and is continuously updated with the latest program information and status. [Ref. 1]

CASS stations will be delivered first to the TPS developer to generate the tools for Unit Under Test (UUT) repair, second to support shore based operations and Sea Operation Detachment (SEAOPDET) personnel training at Marine Corps Air Logistics Squadrons (MALS) and shore Aircraft Intermediate Maintenance Departments (AIMDs), and finally to afloat activities for underway testing and repair. Because of the numerous TPS programs at various stages of development (See Table 1) CASS station and TPS deliveries are carefully coordinated to maintain continuous weapon systems support. [Ref. 1]

TPS PROGRAM	TPS DEVELOPER	TPS	WRA	SRA	SETS	SITE	OTPS	AUR	SECT	WRA DVLP STRT	WRA DVLP END	SRA DVLP STRT	SRA DVLP END	WRA PROD STRT	WRA PROD END	SRA PROD STRT	SRA PROD END	TPS DLVRY FIRST	TPS RATE
AMRAAM	HUGHES TUCSON	32	5	22	6	9	8	2	3	SEP-93	SEP-96	SEP-93	SEP-96	SEP-96	SEP-96	SEP-97	SEP-98	JAN-96	
AN/ALE-47	TRACOR	3	3	0	24	24	0	0	0	FEB-89	AUG-92			DEC-93	OCT-95			NOV-94	2
AN/ALE-50	RAYTHEON	1	1	0	28	28	0	0	0	NOV-96	MAY-97			JUL-96	OCT-00			JAN-00	3
AN/ALQ-126B RF SRA*	COMPETITIVE		0	5	33	30	1	0	0			MAR-95	SEP-97			MAR-98	FEB-99	MAR-98	3
AN/ALR-67(V)3/4	HUGHES EL SEGUNDO		7	8	30	26	3	0	0	DEC-93	DEC-95	DEC-93	DEC-95	JUL-95	SEP-96	JUL-95	SEP-98	JAN-96	3
AN/APG-73 SRA*	MCAIR ST LOUIS	28	0	28	32	32	2	0	0			JUL-94	DEC-95			MAY-96	MAY-97	DEC-95	3
AN/APG-73 WRA	HUGHES EL SEGUNDO	3	3	0	32	32	0	0	0	JUL-92	NOV-94			MAR-95	OCT-95			MAR-95	4
AN/APS-137	NADEP JAX	50	6	44	9	16	10	0	0	MAR-88	OCT-95	MAR-88	OCT-95	DEC-95	DEC-97	DEC-95	DEC-97	JUN-95	1
AN/SQQ-89(V)	WEC/KEYPORT/CRANE	112		112	15	15						MAY-93	OCT-95			JAN-94	OCT-96	OCT-95	1
ATARS	COMPETITIVE	14	14	50	8	5	6	0	0	JUN-95	MAR-98	JUN-95	MAR-98	MAR-98	NOV-98	MAR-98	OCT-98	OCT-98	2
AV-8B*	CESELSA MADRID SPAIN	42	5	37	17	3	6			SEP-94	SEP-98	SEP-94	SEP-98	SEP-97	NOV-98	JAN-97	NOV-98	FEB-97	2
CASS SOS TPS	MARTIN MARIETTA											AUG-92	OCT-94			NOV-93	DEC-94	JAN-95	3
CEC	CRANE/E-SYSTEMS (ECI)	170	8	162	197					JAN-95	JAN-98	JAN-95	JAN-01	JAN-98	JAN-02	JAN-98	JAN-02	JAN-98	3
E-2C AN/ASW-50	COMPETITIVE	13	1	12			2			JUN-95	JAN-98	JUN-95	JAN-98	MAR-97	SEP-99	MAR-97	SEP-99	APR-97	
E-2C CEC	COMPETITIVE	30	13	17			11			OCT-95	OCT-98	OCT-95	OCT-98	JUN-97	JUN-00	JUN-97	JUN-00	AUG-97	
E-2C ECP 412	COMPETITIVE	9	2	7			2			OCT-95	OCT-98	OCT-95	OCT-98	JUN-97	JUN-00	JUN-97	JUN-00	AUG-97	
E-2C ECP 410R1	COMPETITIVE	3	3				1			OCT-95	OCT-98			JUN-97	JUN-00			AUG-97	
EA-6B AIP	GRUMMAN	14	54	0	21	18	5	0	0	NOV-95	AUG-98			NOV-96	SEP-98		MAY-08	AUG-98	1
EA-6B ALQ-149 SRA	LOCKHEED SANDERS	6		39	2	2				NOV-95	NOV-96			NOV-95	JAN-99			JAN-99	0
EA-6B AN/ALQ-149 WRA	LOCKHEED SANDERS	4	7		4	4	3	0	0	NOV-95	MAR-99			NOV-96	MAR-99			NOV-98	0
EA-6B B10 SFE	NSWC CRANE AV	1	1		1	1				OCT-93	JAN-96			OCT-95	JAN-96			JAN-96	
EA-6B RPG	GRUMMAN	28	14	96	21	16	6	0	0	NOV-94	AUG-98	NOV-96	NOV-01	NOV-96	MAY-06	NOV-98	MAY-10	AUG-98	1
EA-6B UEU SRA	AIL CORPORATION			36	23	16	4					NOV-97	NOV-00			NOV-98	JUN-08	NOV-00	0
EA-6B UEU WRA	AIL CORPORATION	5	1	36	24	19	0	0	0	NOV-95	NOV-96			NOV-96	MAY-00			NOV-96	1
F-14 5400B COMP	CDI	1	1	0	16	13	1	0	0	OCT-94	NOV-96			JAN-97	JUL-97	NOV-96		DEC-96	2
F-14 A/B UPGRADE	COMPETITIVE	32		32	16	13	4					JUN-95	JUN-97			SEP-97	NOV-98	MAR-98	2
F-14 B/D COMMON SRA	GRUMMAN	11	0	11	7	8	2	0	0			APR-93	DEC-96			JAN-97	AUG-97	JAN-97	1
F-14 CIBC	FAIRCHILD	1	1		16	2	1	0	0	OCT-94	JUL-96			OCT-96	DEC-97			APR-97	1
F-14 CSDC	TELEDYNE	1	1	0	16	13	1	0	0	OCT-94	JUL-95			OCT-95	SEP-97			MAR-96	1
F-14 PMDIG	FAIRCHILD	1	1		16	13	1	0	0	OCT-94	JUL-96			OCT-96	DEC-97			APR-97	2
F-14 PTID	LORAL	1	1		16	13	1	0	0	OCT-94	APR-97			APR-97	FEB-99			SEP-97	1
F-14D IRSTS SRA	MARTIN MARIETTA	21		21	3	4						APR-94	DEC-96			MAR-97	MAY-97	NOV-96	1
F-14D IRSTS WRA	MARTIN MARIETTA	2	2		3	4		0	0	JUN-93	APR-96			MAY-96	SEP-96			JAN-96	1
F-14D RADAR SRA	HUGHES EL SEGUNDO	27	0	27	3	4	3	0	0			APR-93	SEP-95			NOV-95	FEB-96	MAR-95	1
F-14D SMS/CFE SRA	GRUMMAN	46	0	46	3	4	4	0	0			APR-93	DEC-96			JAN-97	APR-97	OCT-96	1
F-14D WRA	GRUMMAN	19	19	0	3	4	4	0	0	JAN-92	SEP-94			SEP-94	JAN-95			19-SEP-94	1
F/A-18 C/D FLIR	MCAIR ST LOUIS			10	20	20	3					MAY-94	SEP-96			AUG-96	JUL-97	AUG-96	2
F/A-18 E/F	MCAIR ST LOUIS	9	9	58	20	20	58	0	0	MAY-96	MAY-00	MAY-97	MAY-01	MAY-99	MAY-05	MAY-00	MAY-06	MAY-00	3
F/A-18 E/F FADEC	MARTIN MARIETTA	1	1	3	32	32	1	1	5	JAN-97	JUL-99	JAN-97	JUL-99	AUG-99	MAR-01	AUG-99	MAR-01	AUG-99	3
F/A-18 SMS	MCAIR ST LOUIS		0	11	3	3	3	0	0			JUN-93	MAR-96			JUN-95	MAR-96	JAN-96	1
GPWS/CAT III	NADEP CHERRY POINT	5	1	4	2	1	1	0	0	JAN-99	JAN-01	JAN-99	JAN-01	FEB-01	JAN-02	FEB-01	JAN-02	JAN-02	
GPWS/TRANSPORT CAT 1	NADEP CHERRY POINT	8	2	6	2	1	1	0	0	JAN-96	DEC-97	JAN-96	DEC-97	JAN-98	DEC-97	JAN-98	DEC-98	JAN-99	

Table 1. Test Program Set (TPS) Development Program Summary. From Ref. [1].

TPS PROGRAM	TPS DEVELOPER	TPS	WRA	SRA	SETS	SITE	OTPS	AUR	SECT	WRA DVLP STRT	WRA DVLP END	SRA DVLP STRT	SRA DVLP END	WRA PROD STRT	WRA PROD END	SRA PROD STRT	SRA PROD END	TPS DLVRY FIRST	TPS RATE
HARM	TI	14	0	14	3	1	3	0	0			JUN-94	JUN-98			JUN-94	JUN-98	JUN-98	
HARPOON/SLAM	COMPETITIVE	77	9	65		6	0	1	2	JAN-95	JUN-98	JAN-95	JAN-98	JUN-98	APR-00	JUN-97	SEP-99	MAR-98	
JSOW	TI	1	4	0	3	2	1	1	0	JUL-92	APR-96			APR-96	APR-99			JAN-96	1
JTIDS SRA	NADEP NORIS	64	10	54	4	1	4			FEB-94		OCT-90							
JTIDS WRA	MARTIN MARIETTA	3	3	0	10	10	1	0	0	JAN-91	SEP-94			APR-93	MAY-97			SEP-93	
MIDS LVT	NADEP NORIS	27	2	25		1	0	0	0	JUN-98	JAN-02	JUN-98	JAN-02						
MINI DAMA AN/USM-42(V)3	TITAN	24	0	24	0	0	4	0	0			MAR-95	MAR-98	OCT-96	MAR-98	OCT-96	MAR-98	OCT-96	0
MV-22 SRA	BELL/BOEING	290		290	2	2	35					MAR-00	MAR-06			MAR-00	MAR-06	MAR-04	3
MV-22 WRA	BELL/BOEING	50	50	0	20	22	15	0	0	NOV-95	MAY-01			NOV-99	JUN-01			JUN-01	
NAVSEA NUWC KEYPORT	NONE		0	0		1	0	0	0			OCT-93	MAY-96						
OFFLOAD AAM-60 S-3	NADEP JAX	6	2	4	18	16	2			MAR-91	MAR-96	MAR-91	MAR-96	APR-96	SEP-97	APR-96	SEP-97	AUG-96	2
OFFLOAD AN/USM-247 VAST F-14 L1	NADEP CHERRY POINT	6	6	0	19	19	2	0	0	OCT-92	DEC-95			JAN-96	JAN-98			OCT-96	2
OFFLOAD AN/USM-247 VAST F-14 L2	GRUMMAN	21	21		21	21	2			SEP-92	JUL-95			JUL-95	JUL-96			OCT-96	2
OFFLOAD AN/USM-247 VAST F-14 L3	NADEP NORVA	2	7	6	21	21	5			APR-91	DEC-95			DEC-95	DEC-96			OCT-96	2
OFFLOAD AN/USM-247 VAST S-3 L4	WEC	21	21	0	21	21	2	0	0	SEP-93	JUL-96			JUL-96	JUL-97			OCT-96	2
OFFLOAD AN/USM-247 VAST S-3 L5	NADEP NORIS/ALAMEDA	21	21		21	21				NOV-92	JAN-97			JAN-97	JAN-99			OCT-96	2
OFFLOAD AN/USM-247 VAST S-3 L6	R M)	13		13	21	21	1					APR-93	OCT-95			OCT-95	OCT-96	OCT-96	2
OFFLOAD AN/USM-470(V)1	GRUMMAN	21	21	0	27	25	2	0	0	DEC-93	DEC-96			DEC-96	DEC-97			JUN-97	3
OFFLOAD APM-448 RSTS L1	NADEP NORIS	4	3	3	28	29	2	0	0	JUN-93	MAY-96	JUN-93	MAY-96	JUL-96	MAR-98	JUL-96	MAR-98	MAR-97	3
OFFLOAD APM-448 RSTS L3	COMPETITIVE	12	2	10	26	26	2			NOV-94	DEC-96	NOV-94	DEC-96	APR-97	MAR-98	APR-97	MAR-98	OCT-97	4
OFFLOAD ASM-614 ESTS EA-6B	NADEP NORVA	4	4	0	23	22	2	0	0	MAR-93	OCT-96			OCT-96	OCT-96			OCT-96	2
OFFLOAD ASM-614 ESTS S-3	NADEP NORVA	3	3	0	18	16	2	0	0	MAR-93	JAN-97			JAN-97	JAN-99			OCT-96	2
OFFLOAD ASM-614 ESTS SH-60/HH-60	NADEP NORVA	6	6	0	23	21	4	0	0	MAR-93	JAN-97			JAN-97	JAN-99			OCT-96	2
OFFLOAD AV-8B EETS	JAX/NORVA TIF	27	24		18	15	5	0	0	JUL-95	JUL-96			NOV-96	APR-00			JUL-99	2
OFFLOAD AWM-23 RFTS	COMPETITIVE	16	3	11	19	17	2			JAN-96	DEC-97	JAN-96	DEC-97	FEB-98	JUL-99	FEB-98	JUL-99	FEB-98	3
OFFLOAD HATS S-3 L1	RJO ENTERPRISES	17	0	17	19	19	1	0	0			OCT-93	OCT-96			JAN-97	MAR-98	OCT-96	2
OFFLOAD HATS S-3 L2	D.K. DIXON	25		25	1	19	19					OCT-94	SEP-97			SEP-97	DEC-98	JUN-97	2
OFFLOAD HATS S-3 L3	ORGANIC/COMPETITIVE																		
OFFLOAD HIGH POWER ATE	COMPETITIVE	35	20	15	319	40	11			APR-95	OCT-98	APR-95	OCT-98	OCT-98	APR-02	OCT-98	APR-02	OCT-99	4
OFFLOAD TMV F-14B	NADEP CHERRY POINT	2	2	0	6	6	1	0	0	OCT-92	JAN-96			JAN-96	JAN-97			MAR-96	1
SH-60B ALFS	HUGHES FULLERTON	22	2	20	6	6	3	0	0	AUG-93	JAN-01	AUG-94	JAN 01	FEB-01	AUG-01	FEB-01	AUG-01		1
SH-60B BLOCK II	LORAL FED. SYS.	167	21	146	6	6	35	0	0	NOV-98	JAN-02	NOV-98	MAR-04	JAN-02	JAN-04	JAN-04	MAR-08	SEP-02	
T-45 TS	MDA	8	8		2	2	8			MAR-95	SEP-97			SEP-97	SEP-98			SEP-98	2

Table 1. Test Program Set (TPS) Development Program Summary. From Ref. [1].

B. IMPLEMENTATION ISSUES

1. CASS Station Reutilization

Test Integration Facility (TIF) stations designated for TPS development will be reused for other requirements after initial projects are complete. When all follow-on projects are finished the stations will be transferred to the depot or fleet activities. [Ref. 1]

2. Base Realignment And Closure (BRAC)

Shore site consolidations per the Congressionally directed BRAC are a prime concern and complicate the process of allocating stations in an efficient and timely manner. This is addressed in the CASS Implementation planning process. Program adjustments are made as BRAC decisions become final. The basic premise is that intermediate level CASS stations must be positioned where the aircraft will actually be located to minimize impact on cost and readiness before, during and after aircraft transitions. [Ref. 1]

3. High Power Device Tester (HPDT)

Commencing in 1999, a radio frequency (RF) High Power Device Tester (HPDT) ancillary will be delivered for Navy and Marine Corps high power UUT requirements. This allows the removal of four large pieces of transmitter ATE and facilitates support of emerging high power test requirements and future ATE off-loads. [Ref. 1]

C. CIP PLANNING PROCESS

1. Station Allocation

A suite of mainframe computer software tools, consisting of an Oracle relational data base, identify requirements and develop a CASS allocation schedule. Station needs for nearly 100 sites and 77 programs are matched with a 700+ station delivery schedule to ensure station

allocation is completed in an effective and efficient manner. In addition, the database tracks TPS data such as development milestones, delivery dates and resources, ATE transition schedules, shipyard availability schedules, station configurations with required ancillaries, points of contact, and interim support costs resulting from delayed deliveries. [Ref. 1]

A separate Oracle database, the System Synthesis Model (SSM), is integrated with the Oracle relational database. The SSM maintains a record of the parametric test requirements, such as the related instruments and necessary station configuration for each repairable assembly, i.e. UUT, and CASS workload information. This workload data is then used to define station sharing arrangements for each fleet site. The SSM specifies the quantity and configuration of stations needed to support the anticipated workload of a site. [Ref. 1]

CASS stations used for technical or operational evaluation (TECHEVAL/OPEVAL) TPS development are addressed in the Oracle database and will transfer from completed requirements to new requirements. This is a cost saving measure that minimizes idle time and geographic relocation delays. TPS development stations will remain in a relatively stable pool for Test Integration Facility or contractor developer needs for the duration of the CASS program. [Ref. 1]

2. Test Integration Facilities (TIFs)

Test Integration Facilities are used to develop CASS TPS and represent a major cost consideration. There are three TIF avenues to accomplish this task. First, Contractor Furnished equipment (CFE), as in the case of Texas Instrument's commercial CASS stations produced by Automated Test International, is a resource. A second alternative employs

Government Furnished Equipment (GFE) located at the contractor's location. However, this is only feasible when seven or more CASS stations are set up at a single site to produce an economy of scale that will absorb the integration workload. Less than this hardware commitment, i.e., one or two stations, results in queuing problems that impact the TPS development schedule. Third, GFE at consolidated facilities like the NAVAIR PMA-260 managed Naval Aviation Dept (NADEP) CASS sites at Norfolk, Jacksonville, and North Island represent up to 60 stations for the workload. In addition, NUWC Keyport, NSWC Crane, and NISE West San Diego support NAVSEA and SPAWAR TPS development. The PMA-260 facilities were initially established for older ATE off-load support but are available for full TIF services to other government CASS TPS projects. These stations are pooled and serve as a common resource to reduce TPS development time and expense. [Ref. 1]

3. TPS Program Manager's Support Checklist

This checklist specifies the steps and related data required for a program to receive CASS stations at TPS developer and fleet activity sites. Completion of these steps is mandatory before TPS development begins and at least three years prior to destination site system stand up. The three year period is predicated on ship alteration and shore site military construction planning. [Ref. 1]

4. TPS Red Team Package

Fleet I-level support, In Service Engineering (ISE), and total weapon systems support cost are at risk if TPS problems common with older generation ATE are not corrected by CASS implementation. The following list represents some of these problems: [Ref. 1]

Fleet --

- Inadequate Interface Device (ID) self test,
- Run times too long,
- Re-running the TPS took too long to verify component repair,
- Inaccurate or inadequate user documentation,
- Program listing comments insufficient,
- Poor or non-existent ID schematics,
- Illegible Test Program Instructions (TPI) and station display graphics,
- Test diagrams not updated with test program,
- Insufficient test program entry points,
- Poor operator instructions during testing, and
- ID hardware inoperative and or difficult to repair.

In-Service Engineering --

- Inadequate test strategy documentation,
- No source files for TPI, TPS, or tech manuals,
- Test diagrams could not be recreated (copy only); diagnostic flow charts/testing data graphics difficult to recreate and deliver, and
- Multiple computer and software systems are needed to support the test program.

Management --

- TPS development costs are too high,
- Request for proposal preparation is very time consuming with details overlooked,

- Lessons learned are lost,
- ID hardware more complex than necessary,
- Poor TPS transportability between testers, and
- No spares, incomplete provisioning.

The NAVAIR TPS Red Team was established in 1989 to deal with these problems and has defined the following goals: [Ref. 1]

- Promote good ideas and eliminate things that fail to work,
- Standardize CASS TPS procurement,
- Simplify the Request For Proposal generation process,
- Reduce life cycle costs,
- Increase support for Fleet and In Service Engineering communities,
- Obtain all source data for contractor developed items with full data rights,
- Allow early TPS transition to Navy support,
- Establish a forum for TPS problem discussion,
- Ensure the message to TPS industry is clear and consistent, and
- Incorporate lessons learned in all procurement packages so problems are fixed one time only.

These goals will be achieved through the use of a standard, tailorable, TPS acquisition package that specifies performance, maintainability, and logistic support requirements. [Ref. 1]

5. Site Activation Planning Guide (SAPG)

The SAPG is a planning tool for maintenance officers at locations scheduled to receive CASS stations and provides information needed to expedite the installation process. The guide defines the specific site's CASS implementation plan which consists of: [Ref. 3]

Site Specific Information --

- Station configurations and quantities,
- Facility interface requirements,
- Workcenter arrangements and,
- Utilities issues.

Supporting Elements --

- AIMD Officer (AIMDO) checklist,
- TPS delivery schedule,
- TPS storage matrix,
- Off-load UUTS not supported on the CASS matrix,
- Explanation of the CASS manpower requirements spreadsheet,
- AIMDO training process flow chart,
- Point of Contact Personnel Directory and,
- Terms, acronyms, references, and a SAT SAPG evaluation form.

D. CASS INSTALLATION

1. Navy CASS Installations: Ship Alterations (SHIPALTS) and Military Construction (MILCON)

CASS station shipments and installations are NAVAIR funded for all GFE deliveries and processed by regional NADEP personnel located at Jacksonville, North Island and Norfolk. Fleet CASS deliveries occur in conjunction with fully functional TPS in order to minimize impact on local activity readiness. Site surveys, conducted two to three years before installation, are complemented with a final site evaluation 90 days before station delivery. The station is then installed, activated, and sold using the site's own System Maintenance and Test/Calibration (SMAT/CAL) equipment that was delivered concurrently with the station. The NADEP installation team is responsible for all hardware mounting, power hookups, equipment power up, completion of calibration, and system self testing checks. After everything is performing according to specifications the team leader and customer site representative co-sign the certificate of completion. [Ref. 1]

NAVAIR PMA-260/PMA-251, NAWC AD Lakehurst, and NAVSEA PMS-312 coordinate the entire SHIPALT process from the drawing board to final installation. The ship AIMD and Type Commander (TYCOM) provide feedback for station location planning. Because installation requires major structural modifications, CASS stations are usually installed during major shipyard availability periods [Ref. 1].

A proactive AIMD and TYCOM interface with the shipyard and contractors is critical for a timely and successful installation. The sometimes chaotic shipyard environment can result in expensive delays due to the loss of corporate knowledge, high personnel turnover

during a yard period, and unexpected problems generated by other issues, such as fires, flooding, and shipboard power and ventilation/air conditioning failures.

Shore AIMDs deal with MILCON issues and must coordinate installations, including funding, with their respective Public Works Centers (PWCs) and TYCOMs. NAWC Lakehurst will conduct site visits to determine facility modification needs. Careful coordination with PMA-260 and the TYCOM is necessary to ensure phased removal of existing ATE in conjunction with activation of CASS and the required TPS. Each AIMD will have a specific transition plan addressing the upgrade to CASS and subsequent SEAOPDET training requirements. As in the case of SHIPALTs, coordination between each AIMD and NAVAIR is essential for continuity and maximum fleet operational support. [Ref. 1]

2. Marine Corps CASS Installations

Marine Corps Air Logistics Squadron (MALS) sites differ from Navy installations in that station deliveries are not tied to specific TPSs for every type of aircraft. Marine Corps CASS requirements are defined by Common Contingency Support Packages (CCSPs) which are based on Air Combat Element (ACE) workload and not limited to the type or quantity of aircraft at the specific MALS. For example, a CCSP may support avionic systems common to the F/A-18 Hornet, MV-22 Osprey, AV-8B harrier, and EA-6B Prowler aircraft. This serves as a foundation consisting of CASS plus the common TPSs. Aircraft platform specific, such as F/A-18 or MV-22 aircraft, TPSs are provided via Peculiar Support Contingency Packages (PSCPs) which are then combined with the CCSP at the operational location to support the aircraft selected for the overall mission. [Ref. 1]

III. CASS NAVY TRAINING PLAN (NTP) OVERVIEW

This chapter discusses the elements of the CASS Navy Training Plan (NTP) beginning with the definition and purpose of the NTP. Operational uses, systems replaced, and a functional description of CASS stations and supporting Test Program Sets (TPSs) are described next. The chapter concludes with a definition of maintenance, operation, staffing, and training concepts.

A. DEFINITION AND PURPOSE

The CASS NTP is a document developed by the Naval Air Systems Command (NAVAIRSYSCOM) listing life cycle support elements required for CASS. The plan is the official statement of resource requirements, billets, personnel, and training inputs necessary for the introduction and operational use of CASS. The NTP assigns responsibilities for planning, programming, and implementation actions to ensure: [Ref. 4]

- Billets, personnel, military construction, training support, and training are coordinated with CASS hardware/TPS development and production.
- Efficient and adequate training programs are phased in with the introduction system modifications.
- Policies established for system acquisition within the Department of the Navy are supported.

B. CASS OPERATIONAL USES

CASS represents the latest ATE technology. It is used at intermediate maintenance activities, ashore and afloat, to test electronic components that are testable by automated

means. The system provides state-of-the-art capability that will achieve operational effectiveness by increasing throughput of electronic Units Under Test (UUT). CASS reduces the number of ATE installations, space requirements, overall logistic support costs, and adds flexibility to the process of assigning test station workloads. The system is currently targeted to support avionic systems in the AV-8B Harrier, EA-6B Prowler, F/A-18 Hornet, F-14 Tomcat, S-3B Viking, and SH-60 Sea Hawk aircraft. CASS will also support the Advanced Medium Range Air to Air Missile (AMRAAM), High speed Anti-Radiation Missile (HARM), the Joint Tactical Information Display System (JTIDS), and the SQQ-89 Aegis Anti-submarine Warfare (ASW) Combat System. The system's flexibility enables transfer of workloads assigned to older ATE such as the Versatile Avionics Shop Test or Hybrid Automatic Test Set to CASS. [Ref. 2]

C. EQUIPMENT/SYSTEM/SUBSYSTEM REPLACED

NAVAIRSYSCOM policy states the objective of the CASS program is to consolidate electronic and avionic support into on standard ATE system. The following considerations determine which ATE systems will be transferred to CASS: [Ref. 2]

- Systems with Initial Operational Capability dated FY92 and beyond will be supported on CASS.
- Existing electronic systems will be transistioned to CASS as they are upgraded.
- Systems with an Initial Operational Capability date of FY90 thru FY92 will have interim support until supported by CASS.
- Obsolete ATE, which can no longer be economically maintained, will be off-loaded to CASS based on fleet support priorities and economic analysis.

ATE systems targeted for replacement by CASS: [Ref. 2]

- Electro-Optical System Test Set (EOSTS),
- Radar Test Bench Set (RTBS),
- Electrical Equipment Test Set (EETS),
- Inertial Measurement Unit Test Set II (IMUTS II),
- Electronic System Test Set (ESTS),
- Night Attack Intermediate Avionics Test Set (NIATS),
- Computer Test Stations (CTS),
- Versatile Avionics Shop Test (VAST),
- Digital Module Test Set,
- Hybrid Automatic Test Set (HATS),
- Computerized Automatic Test (CAT-IIID),
- Automatic Test Set (ATS) V1 and V2,
- Hybrid Test Set (HTS),
- BSY-1, SQQ-32, UYK-44 Tester, and TAT Tester (NAVSEA).

D. FUNCTIONAL DESCRIPTION: CASS STATION AND TPS

1. CASS Station

The basic CASS station is a five rack integrated test system referred to as the Hybrid Tester. Adding a sixth specialized rack allows CASS to be configured into three additional types of testers. CASS is designed to accommodate a varying workload and allow TPSs to be transferred among four different configurations: [Ref. 2]

- Hybrid,
- Radio Frequency (RF),
- communication, Navigation, and Identification (CNI),
- Electro-Optical (EO).

CASS features instrument-on-a-card architecture. The instruments communicate with an asset controller card which communicates with the host computer. Communication between CASS stations occurs via an ethernet Local Area Network (LAN) system. This is a high speed transmission medium that detects and reroutes conflicting signals and enables CASS to perform stimulus and measurement at the same time. The Operator/Maintainer uses a 79 key keyboard, barcode reader wand, and trackball assembly to control system input. The trackball is the primary input control device and moves a pointer around the screen. CASS software for the technician interface is menu driven and symbolized with icons on a flat panel screen. The icons represent actions to be performed by the system. [Ref. 2]

2. CASS TPS

A TPS is used to verify the performance of a UUT, such as a radio receiver or related component, and isolate failures to a specific area. A TPS is developed for a unique UUT and contains four basic elements: [Ref. 2]

- Test Program (TP). Contains a coded sequence which provides a set of instructions that determines the performance of the UUT. The TP isolates to a faulty subassembly or piece part.
- Interface Device (ID). Provides mechanical connections, electrical connections, and signal conditioning between CASS and the UUT. It may contain additional components to augment CASS capability.

- Test Program Instruction (TPI). Provides information for testing which cannot be conveniently provided or displayed by CASS under TP control.

- Supplementary Data. Information, text, schematics, and logic diagrams necessary for analysis of the TPS and UUT in the event of problems during the testing process.

E. CONCEPTS: MAINTENANCE, OPERATIONS, MANNING, TRAINING

1. Maintenance

CASS specifications include Built In Test (BIT), Built In Test Equipment, and Self Maintenance Test (SMAT). CASS will detect system malfunctions on line and automatically identify the faulty Shop Replaceable Assembly (SRA). Maintenance personnel remove and replace the defective assembly. The removed components are processed at the designated repair facility. All maintenance requirements are handled at either the intermediate or depot level. [Ref. 2]

a. Organizational Level Maintenance

Organizational level maintenance is performed by CASS Operator/Maintainers at the Intermediate Maintenance Activity (IMA) level. It consists of preventive maintenance, i.e.,daily confidence tests or scheduled tasks at specified intervals, and corrective maintenance stemming from system faults detected during operation which results in the replacement of modules or SRAs. [Ref. 2]

b. Intermediate Level Maintenance

CASS is operated and maintained by CASS Operator/Maintainers and Calibration/Advance Maintenance Technicians assigned to the various CASS work centers.

The system has four levels of testing that monitor operation and advise the operator of failures and the related cause. Levels one and two are the power up BIT and SMAT confidence tests and are automatically executed on test set power up. Level three is a comprehensive SMAT that checks test set components but not electrical paths between interface points. This test runs when the set is first powered up and during idle conditions. Level four is SMAT input-output testing of all components including their electrical paths and interface devices. It is operator initiated and requires a special TPS. [Ref. 2]

c. Depot Level Maintenance

Depot Level Maintenance consists of fault isolation of all new design SRAs using Support of Support (SOS) TPSs and the repair of defective SRAs. Depot level personnel repair specified SRAs, calibrate embedded standards, and perform all tasks considered to be beyond the capability of the IMA. [Ref. 2]

d. Technical Assistance

Navy Engineering and Technical Services (NETS) from the Naval Engineering Support Unit (NAESU) provide support on an on-call basis to fleet activities for technician training needs. [Ref.2]

e. Interim Maintenance

The contractor provides interim support until Navy organic support is established. The Navy Support Date was October 1995 for the Hybrid, CNI, and RF stations. The EO station will be supported by January 1997. [Ref. 2]

2. Operations

CASS is capable of operation 22 hours a day. Two hours are scheduled for daily maintenance. [Ref. 2]

3. Staffing

CASS station staffing is based on Operator/maintainer, Calibration/Advanced Maintenance Technician, and preventive-corrective maintenance requirements. Site labor is driven by the number of stations employed at each location. System Synthesis Model workload, station configuration, and quantity projections are the basis for the labor requirements forecast in the current NTP. In the future labor will be based on actual workload data, maintenance requirements and related labor hours, from each site. [Ref. 2]

a. Navy Personnel

CASS stations are staffed to operate two eight hour shifts, five days per week at shore AIMDs and two 12 hour shifts, seven days per week on deployed carrier AIMDs. Personnel from Shore Activity Sea Operational Detachments, (SEAOPDETs) augment their host aircraft carrier AIMDs. The current manpower ratio for Operator/Maintainer is approximately 1.3 per station per shift and one Calibration/Advanced Maintenance Technician per ten stations per shift. [Ref. 2]

NEC 6704 AT and ET personnel, Intermediate Maintenance/Operator, operate the system and perform SMAT. AT and ET personnel with NEC 6705, Intermediate Maintenance Calibration/Advanced Maintenance Technician, perform on-line calibration and advance system maintenance. [Ref. 2]

b. Marine Corps Personnel

Marine Corps CASS stations are staffed to operate two 12 hour shifts, seven days per week at all sites. Marine Corps personnel with MOS 6467 perform all maintenance including on-line calibration and advanced maintenance. The current labor ratio is on technician per station per shift. The Marine Corp has determined that MOS 6467 will be devoted exclusively to CASS and will not be employed for ATE applications. [Ref. 2]

4. Training

CASS training is applicable to both military and civilian personnel and ensures qualified technicians are available to operate, maintain, and troubleshoot CASS in support of the fleet. [Ref. 2]

a. Initial Training

Initial training was provided through contractor services tailored for NAMTRAGRUDET instructors, Technical and Operational Evaluation personnel, NAESU personnel, Industrial personnel located at the depots, and cadre personnel from fleet CASS sites. This process is repeated as new CASS configurations are developed. [Ref. 2]

b. Follow-on Training

Follow-on training was established at Maintenance Training Unit (MTU) 3010, NAMTRAGRUDET Oceana, in January 1994 and at Maintenance Training Unit (MTU) 3011 NAMTRAGRUDET Miramar in January 1995. Initially, follow-on training consisted of a three week Operator/Maintainer Course and a seven week Calibration/Advance Maintenance Technician course. Due to NAMTRAGRU and fleet concerns about Operator/Maintainer

skills much of the Calibration/Advanced Maintenance course content was shifted to the Operator/Maintainer curriculum which is now seven weeks long. The Calibration/Advanced Maintenance course has been reduced to two weeks. The course objective is to ensure students develop adequate skills through classroom and laboratory instruction for all CASS station configurations. The new courses were ready for training (RFT) in January 1995. Curricula track number, length and location information follows: [Ref. 2]

CASS Operator/Maintainer (USN

Track number	D/E-198-6102
Track length	51 Days (revised)
RFT dates/locations	Jan 94/MTU 3010, Oceana
	Jan 95/MTU 3011, Miramar
Source rating	AT/ET
Skill identifier	NEC 6704
Prerequisite	Avionics "A" or Electronics "A" School
Quota control	NAMTRAGRUDET Oceana and Miramar

CASS Calibration/Advanced Maintenance Technician (USN)

Track number	D/E-198-6101
Track length	16 Days
RFT dates/locations	Jan 94/MTU 3010, Oceana
	Jan 95/MTU 3011, Miramar
Source ratings	AT/ET
Skill identifier	NEC 6705
Prerequisite	NEC 6704, E-5 through E-7
Quota control	NAMTRAGRUDET Oceana and Miramar

CASS Test Station Intermediate Operator/Maintainer Technician (USMC)

Track number	D/E-198-6103
Track length	65 Days
RFT dates/locations	Jan 94/MTU 3010, Oceana
	Jan 95/MTU 3011, Miramar
Source rating	AT
Skill identifier	MOS 6467
Prerequisite	Avionics "A" or equivalent, E-2 and above
Quota control	EAMTU, Millington, Tenn.

Aviation Depots, Naval Weapons Stations, and Naval Engineering Support Units are required to maintain a trained manpower pool to support CASS. This training is accomplished using organic CASS assets or a combination of organic and NAMTRA resources. Industrial personnel compete for NAMTRAGRUDET quotas on a priority basis. Specific requirements, which training track etc., are determined by the parent industrial activities. [Ref 2.]

(Tables listing Billets and Training Requirements for 1995-1999 are located in the Appendix)

c. On-Board Training (MTIP)

The CASS Maintenance Training Improvement Program (MTIP) is being developed to establish an effective and efficient training system for fleet training requirements. The MTIP concept uses diagnostic testing to identify and correct training deficiencies. [Ref. 2]

d. Other On-Board Training (MATMEP)

The Maintenance Training Management and Evaluation Program (MATMEP) is designed to meet Marine Corps requirements. It identifies and prioritizes training needs by task and occupational speciality. MTIP questions coupled with MATMEP help identify training short-falls suitable for remedial training applications. [Ref. 2]

IV. TECHNICIAN TRAINING: BACKGROUND AND STATUS

The CASS Implementation Plan and related Navy Training Plan are complementary, on-going processes which address the complex issues of effective and efficient system implementation concurrent with comprehensive personnel skill development. The chapter begins with a description of general personnel and training considerations applicable to any new weapons system program. This is followed with comments on historical ATE training deficiencies, a review of a CASS training situation analysis study conducted in 1995, information on the status of CASS training at Naval Aviation Maintenance Training Group Detachments (NAMTRAGRUDETs), and concludes with an evaluation of the CASS manpower development process.

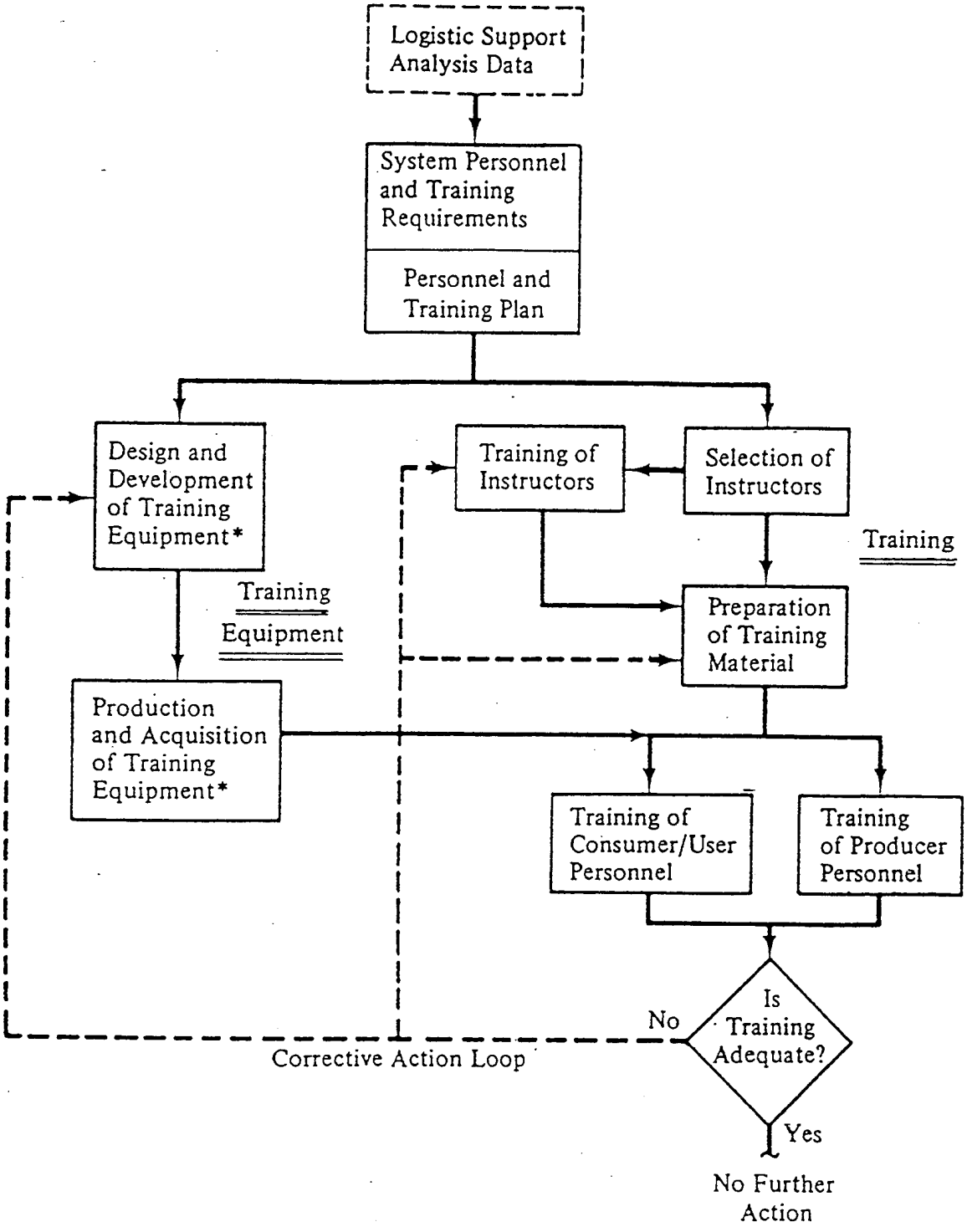
A. PERSONNEL AND TRAINING: BASIC CONCEPTS

Personnel and training requirements are established through (1) an operator and maintenance functional analysis, (2) a detailed task analysis that identifies the number of personnel and skills required for system operation and support, and (3) a comparison of the personnel requirements for the system with personnel quantities and skills available in the user organization. Operator and maintenance personnel requirements evolve from human task and logistic support analysis. The difference between system requirements and personnel skills is addressed through a combination of formal and on-the-job training (OJT). Training requirements must include personnel initially assigned to the system and replacement personnel for the duration of the system's life cycle. [Ref. 5]

After the system is operational, data is available from all levels of operational support to evaluate organizational effectiveness and refine the training process. For example, the number of personnel needed for operation, maintenance labor hours expended, job performance, personnel attrition rate and general morale must be addressed to determine if the initial personnel selection criteria and training program are adequate. Additional training may be necessary if excessive maintenance labor hours or poor job performance is indicated. High personnel attrition rates indicate a requirement for continuous formal training. However, if the system is relatively simple and operator/maintainer errors are minimal, then training may shift from formal to OJT. [Ref.5]

A personnel and training plan is developed from the requirements identified in the logistics support analysis process and is tailored to the organization's needs. It is designed to produce the requisite skills initially needed to operate and maintain a system and provide for future personnel training (See figure 2). The plan should cover:

- The training of system operators including type of training, length, basic entry requirements, brief program/course outline, and output expectations.
- The training of maintenance personnel for all levels of maintenance including the type of training, length, basic entry requirements, brief program/course outline and output expectations.
- Training equipment, devices, aids, simulators, computer resources, facilities, and data required to support operator and maintenance personnel training.
- A proposed schedule for initial operator and maintenance personnel training, and a provision for the accomplishment of replacement personnel training throughout the system life cycle. [Ref. 5]



*Training Equipment Includes Simulators, Software, Visual Aids, Mockups, Mobile Units, Graphics, Film, etc.

Figure 2. Training Development and Evaluation (Basic Process). From Ref. [5].

B. HISTORICAL ATE AND MANPOWER DEVELOPMENT PROBLEMS

Due to a proliferation of problems reported by the fleet with the Versatile Avionics Shop Tester (VAST) and other ATE, the Assistant Secretary of the Navy for Research and Development requested a study of problems and solutions in 1975. An ad hoc committee was established, consisting of representatives from the Naval Material Command (NAVMAT), the Systems Commands, their respective field activities, the fleet, and industry consultants. The results of study were presented in a 1976 report titled "Report On Navy Issues Concerning Automatic Test, Monitoring and Diagnostic Systems and Equipment" which identified a new direction for Navy ATE acquisition and management. [Ref. 6]

The committee reviewed all electronic test equipment problems relating to hardware, software, TPS, equipment acquisition, integrated logistics support planning and management, personnel staffing, training, and the Navy action required to resolve the issues. They determined that the Navy ATE planning, acquisition and implementation process was inherently flawed. The primary cause was the fact that weapon system project managers and prime weapon system contractor's incentives were mutually aligned and dependent on producing superior weapon systems in deliverable quantities within budget and schedule parameters. These objectives were not consistent with the need to make trade-offs between weapon system sophistication and supportability. In essence, buying and installing ATE without regard to all future support elements created a bow wave of logistics support problems that degraded readiness and drove up total life cycle cost. [Ref. 6]

Inadequate training and manpower to operate and support intermediate level ATE was another of the 20 major problems identified by the study and was expected to grow as end

items and ATE systems became more sophisticated. There were many causes such as:

- Retention of highly skilled and trained Navy technicians was difficult due to a lack of incentives and competition with industry in the labor market.
- Navy training was inadequate to operate and maintain deployed ATE in the fleet, and the deficiency gap was expected to increase due to the introduction of increasingly complex weapons systems and ATE systems.
- Staffing levels at AIMD ATE shops were inadequate.
- Navy organizational personnel assignment procedures produced an inadequate skill distribution resulting in a lack of support for intermediate level activities. The level of technical expertise required generally did not exist within the Navy, but was supplied by contractors in many cases.
- Proliferation of ATE complicated the training requirements.

The following items were assigned to the Chief of Naval Education and Training (CNET) for implementation action:

- Provide career plans and incentives to improve retention of highly trained technical personnel.
- Revise existing curricula and training programs in order to force them closer to actual ATE training needs. Training should also be provided for new and planned ATE systems, BIT, monitoring systems, and test program preparation.
- Continue R&D in improved, lower cost automated teaching methods in order to keep pace with the additional teaching demands of more complex technologies.
- Analyze the overall training system in terms of its impact on fleet problems of inadequate skill levels in ATE shops and inappropriate distribution and assignment of fleet personnel.
- Revise current staffing levels, requirements, and procedures for determining staffing and skill levels in intermediate maintenance level activities. [Ref. 6]

The CASS Program was established as a result of the problems and follow-on action defined in the report [Ref. 7]. The CASS Navy Training Plan subsequently evolved to ensure adequate manpower with the requisite skills are assigned to CASS activities [Ref. 8].

C. TRAINING SITUATION ANALYSIS REPORT

This section reviews the "Training Situation Analysis Report" [Ref. 9] prepared by, OC Incorporated, a NAVAIR contractor that performed an analysis of CASS training program equipment requirements in FY95. The study is based on a review and evaluation of first generation ATE programs, guidance documents, and weapons systems acquisition plans to determine if the proposed training equipment requirements were adequate. Data were collected from the ATE issues report prepared for the Assistant Secretary of the Navy in 1976, the first CASS NTP published in 1987, and the Integrated Logistics Support Data Specification of the original GE produced equipment contract.

1. Report Summary

The Cass Program mandated new approaches to the acquisition and life cycle support processes. Due to lessons learned from the first generation of ATE, the CASS Training Program is designed to emphasize quality at minimum cost. This rationale is based on a "transferability of skills" theory. To be more specific, the skills to operate and maintain the CASS Station and related TPSs are the same skills required to support a wide variety of UUTs from weapons systems related to airborne, surface, subsurface or inter-service origin. The theory appears sound but is viewed with skepticism by weapons systems acquisition and fleet maintenance managers.

Training concepts initially considered adequate to support CASS are not favorably accepted by managers and fleet technicians. For example, weapons systems acquisition managers prefer training courses that generate specialized technicians. Maintenance managers want to offset training shortfalls by requesting engineering technical support to provide specialized training at the fleet level. Training management opposes curriculum specialization and supports Computer Based Training (CBT) as an alternative that would enable each individual trainee to develop specific skills.

Because of these different management views, the CASS Training Program plans to use a representative sample of Weapon Repairable Assemblies (WRAs) and Shop Replaceable Assemblies (SRAs), i.e., UUTs, and TPSs ranging from simple to complex for specialized hands-on training. This compromise is intended to keep costs as low as possible and still meet desired training track objectives, but does not comply with an specific management scheme. The NAMTRAGRUDETs will consider training inadequate in situations where acquisition managers do not support the program with required WRAs, SRAs, and TPSs.

The Training Resource Sponsor (RS), Chief of Naval Operations (CNO (N889)), oversees policy and direction for all aviation training programs. The RS has been directly involved with CASS training development through the NTP and Maintenance Training Requirements Review (MTRR) process since establishment of the CASS program. However, acquisition management has not consistently supported the positions of the RS. As a result, the training community has experienced serious problems because there is not an agreed upon best single approach to training.

The CASS Program Manager leads the CASS implementation effort throughout the DOD. From a training perspective, NAVAIR PMA-205 leads the training acquisition process. The CASS Training Assistant Program Manager for Logistics (TAPML) should be given authority to lead a coordinated effort involving all weapons system TAPMLs, whose systems will be supported on CASS, to ensure logistics resources are allocated according to the best interests of the fleet.

Equipment required for CASS training, the list of representative WRAs and SRAs, is subject to change (See Figure 3). It was developed in 1990 based on the best information available regarding UUTs from offload and emerging programs. Decisions about systems targeted for CASS support will dictate the composition of UUTs best representing the fleet's training needs.

At the present time there are deficiencies. TPS development failures during CASS Technical Evaluation and non-support from weapons systems managers have significantly impacted WRA/SRA and TPS availability for the NAMTRAGRUDETs. Instructors consider the equipment designated for CASS training to be essential and report the lack of assets on their Equipment Shortage List (ESL). They also report training as deficient. To overcome this problem, fleet maintenance management has sent some of their technicians to TPS development Test Integration Facilities for OJT to obtain hands-on training.

2. Report Conclusions

The OC Incorporated research conclusions are:

- All managers must agree to the direction mandated in the CASS Program under direction of the Assistant Secretary of the Navy for Research and Development.

Program	Commodities	Complexity
TRANSITION PROGRAMS		
F-14 VAST	AN/ASW-52 PITCH COMPUTER	COMPLEX
	DCU-179/A SKID CONTROL	SIMPLE
	AN/AVA-12 ANALOG DISPLAY INDICATOR	COMPLEX
	CP-1166B/A AIR DATA COMPUTER	MEDIUM
	CP-1448/AA SIGNAL DATA CONVERTER	COMPLEX
S-3 VAST	AN/ARC-156 UHF TRANSCEIVER	COMPLEX
	OL-320/AYS SONAR DATA COMPUTER	MEDIUM
	AN/APN-200 RADAR NAVIGATION SET	MEDIUM
S-3 AAM-60	OR-263/AA SENSOR TURRET ASSY	COMPLEX
	OR-263/AA GIMBAL POWER SUPPLY	MEDIUM
ASM-614	AN/ASN-123 NAVIGATION COMPUTER	COMPLEX
F/A-18 RSTS	RADAR RECEIVER/EXITER	COMPLEX
	RADAR ANTENNA	SIMPLE
INTRODUCTION PROGRAMS		
ASM-614	AN/ASN-150 TACTICAL DATA PROCESSOR	COMPLEX
NEWTS & USM-392	AN/ALR-67(V) ECM COMPUTER	MEDIUM
APM-438/ APM-469	AN/APS-137 RADAR TRANSMITTER	COMPLEX
EA-6B	AN/ALQ-149 DIRECTION FINDER (DF) AND COMMUNICATION SIGNAL ANALYZER (WRA-6)	COMPLEX
EA-6B RPG	AN/ALQ-99(V) PREPROCESSOR CLUSTERER (WRA-11)	COMPLEX
	AN/ALE-47 PROGRAMMER	SIMPLE

Figure 3. Representative Sample of WRAs and SRAs. From Ref. [9].

- NAVAIR PMA-205 must ensure CASS leads the training logistics acquisition effort for weapons systems to be supported on CASS. This requires teamwork not exhibited under first generation ATE programs.

- All logistics element managers must provide the equipment assets to the training sites as soon as possible. Asset non-availability must be documented in writing.

- Naval Air Maintenance Training Group (NAMTRAGRU) must become flexible and innovative toward changes in their course training lab environment.

- NAMTRAGRU must redefine their class-to-lab and instructor-to-student ratios to fulfill CASS objectives. The class-to-lab ratio should be 20% to 80% with each student receiving 80% hands-on lab training. This will increase resource requirements. The two CASS courses must have the same instructor to student ratio to overcome scheduling conflicts. This change will also require more resources.

- The CASS Training Resource Sponsor, CNO (N889), and CMC (TDA) must approve and support the role CASS plays in the Regional Maintenance Center (RMC) concept. PMA-205 must follow CNO and CMC policy and direction. This requires a unified approach to hardware and software acquisition.

- Manpower claimants must raise the CASS priority for staffing to satisfy CASS Implementation Plan schedules. This must include the Chief of Naval Education and Training (CNET) instructor computations based on NTP requirements.

D. STATUS OF CASS TRAINING AT THE NAMTRAGRUDET

CASS training was established at MTU 3010, NAMTRAGRUDET Oceana, in January 1994 and at MTU 3011, NAMTRAGRUDET Miramar, in January 1995. The Curriculum Model Manager, NAMTRAGRUDET Oceana, developed the initial Training Task List, individual training topics etc., from data based on the curriculum provided by the CASS Station prime contractor, technical manuals, previous ATE instructor experience, and interviews with prime contractor subject matter experts. OC Incorporated, a NAVAIR contractor, conducted a training task analysis [Ref. 10] and established a method to analyze

and further consolidate this data into an updated job task base line. Emerging and transitioning UUT TPS data was then processed against the baseline and potential additions to CASS training were identified. As a result, a viable training management tool is now in place to determine future training requirements. In addition, the training task analysis concluded the "transfer of skills" concept/theory was valid and a high degree of skill transfer exists between CASS station, CASS Support of Support TPSs, and the weapons systems UUTs TPSs analyzed. Specifically, for every 801 job tasks reviewed, i.e., step-by-step procedures to complete a maintenance action, only one task was identified as an additional training requirement. Emerging and transitioning weapons systems UUTs TPSs will continue to be analyzed for potential additions to training. In general, the curriculum closely supports known training requirements and will develop the skills necessary to satisfy the training track objectives of system operation, maintenance, and calibration.

Interviews conducted with CASS training personnel at NAMTRAGRUDET Miramar in November 1995 disclosed problems relating to training guides, technical publications, the type and quantity of CASS Station equipment, and a lack of representative WRAs, SRAs, and related TPSs [Ref. 11]. The CASS Station equipment issues are the most serious and may significantly impact NAMTRA capability.

First, the AN/UYK-105 Optical Reader, employed as a substitute for the actual CASS Station VAX 3100 input device and monitor, does not provide the student with the same process or capability. NAMTRA states that the following six Operator and Maintainer topics are adversely affected:

- Introduction to CASS. Students have to visualize the actual display of the CASS Station monitor as the AN/UYK-105 reader will not provide the same information.
- Automated Technical Information (ATI). Log on procedures do not follow the same lesson plan and require further instruction to turn on the CASS Station.
- Intermediate Maintenance operations Management (IMOM). Students cannot see and utilize the IMOM icons, command line, test window or text line.
- CASS Test Executive. The display does not represent the actual CASS Station and students have to visualize what the display should look like.
- Power Up, Power Down, and Status Monitoring. The display does not appear the same as it will on an actual CASS Station monitor.
- CASS SMAT Testing. The display does not appear the same as it will on an actual CASS Station monitor.

In addition, the AN/UYK-105 Optical Readers do not efficiently read the ATI publications disk. The Master Publications Index and the Main Index pages are too large, cannot be reduced, which forces the student to move the page around the screen to see all of the data. [Ref. 12.]

Second, the Support of Support TPSs and Pneumatics Installation Kit have not been received. They are required for new courses already in progress. These classes are degraded due to the inability to teach lab functional task areas supported by the assets. [Ref. 13]

Third, the number of CASS Stations currently installed is not sufficient to meet future student throughput requirements. Three additional Hybrid Test Stations, two Communication Navigation Instrument Stations and nine Off-Line Readers are needed to accommodate additional student load planned for Oceana and Miramar. The CASS Maintainer/Operator course, already overloaded, can not accommodate increasing student demand. [Ref. 14]

E. EVALUATION OF TECHNICIAN TRAINING

The basic training elements of a comprehensive and effective human resource development program were identified in the first section of this chapter. A 1976 report prepared for the Assistant Secretary of the Navy for Research and Development [Ref. 6] identified numerous first generation ATE shortfalls that illustrate a failure to satisfy these training elements. Personnel development was cited as one of 20 major problems. This resulted in a mandate to develop a skilled technical workforce capable of meeting fleet aviation readiness requirements without reliance on direct prime contractor support. In addition, billet planning and the billet assignment methodology were to be revamped to accurately reflect a command's needs and to facilitate labor planning.

The CASS Program was established to meet the Navy's ATE needs. A CASS Implementation Plan and supporting Navy Training Plan were formulated to ensure hardware/software installation is coordinated with manpower development to maintain maximum aviation support during the transition from current ATE to CASS. Problems are expected in a program of this magnitude. Unforeseen technical issues with software or hardware components, changing fleet priorities, and site activation problems all affect the implementation process. To counter this situation both plans are comprehensive, dynamic, and proactive processes that attempt to prevent or minimize the effect of problems on the training infrastructure and fleet.

OC Incorporated's Training Situation Analysis Report [Ref. 9] discussed the various conflicting views held by weapons systems acquisition, maintenance, and training management regarding CASS training content and the need for each student to have specialized hands-on

WRA/SRA/TPS experience. The report presents several strong recommendations for these different management entities to regroup and define a mutually agreeable and attainable CASS Training Program goal. It is the thesis author's opinion that this requires additional WRA/SRA/TPS assets to address the hands-on experience issue before compromise involving degree of training specialization can be reached. As stated in the Training Situation Analysis Report [Ref. 9] the CASS Training Program intends to use a representative sample of UUTs and TPSs for student training. This is supported in the CASS Implementation Plan [Ref. 1]. As these assets are received and integrated in the training curriculum the various management views should begin to converge on a single, supportable training program goal.

NAMTRAGRUDET Miramar has implemented CASS training but is undergoing problems stemming from the deficiencies identified in the previous section of this thesis. For example, training is reported to be degraded by 25% in the Operator/Maintainer course due non-receipt of numerous assets, including the CASS Station SOS TPS, required for various lab exercises [Ref. 13]. This lack of assets does not stop student training but forces instructors to use alternate approaches whenever possible. Using the CASS SMAT procedures to simulate SOS TPS exercises is one example [Ref.11]. The training staff also strongly desires to use aircraft system WRAs/SRAs for lab training support. This is documented on an Integrated Logistic Support Meeting action chit [Ref. 15] submitted by NAMTRAGRU to the CASS Program office in March 1992. It states the lack of required WRAs/SRAs/TPSs will degrade the instructor's ability to train. Follow-up status reports indicate sufficient problem visibility but do not specify when the items will be available. Until the WRAs and SRAs are in place, the NAMTRAGRUDET Miramar instructors believe

training is less than ideal and is degraded by 25% [Ref. 11]. The thesis author agrees that training will be enhanced when all required and desired WRAs, SRAs, and TPSs are received, but is of the opinion that a training degradation assessment must be based on specific, established curriculum that can not be taught.

At the present time CASS is in the early stages of implementation. The CASS Implementation Plan, Navy Training Plan, and NAMTRAGRUDET curriculum address all the basic elements required for personnel development and collectively ensure successful CASS implementation in the fleet. When NAMTRA receives all CASS Station hardware and related TPSs, curriculum support will be virtually complete. The training program is well underway and structured to keep pace with future needs. Adding aircraft specific WRAs, SRAs and TPSs to the curriculum will improve the trainee learning experience and partially satisfy the desire for hands-on weapons system component training. However, the author concludes that the CASS Training Program is sound in its current form and any interim WRA/SRA training experience shortfalls can be offset by fleet workcenter OJT, MTIP or NAESU support. Interviews with AIMD avionics personnel indicate technicians graduating from the CASS Operator/Maintainer and Calibration/Advanced Maintenance courses are skilled and meet performance expectations [Ref. 16].

V. CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

The Consolidated Automated Support System (CASS) is now entering the fleet. This research has examined the human resource development process established to generate a skilled work force for CASS operation and maintenance. Answers to the primary and subsidiary research questions are presented below.

1. Primary Research Question

Will the CASS Implementation Plan and related Navy Training Plan ensure personnel staffing and skills are sufficient to successfully support CASS implementation in fleet activities? In the author's opinion the answer is yes. The plans clearly define and support CASS Station, TPS, technician staffing, and training needs for fleet implementation. The CASS implementation planning process produces a tailored site activation plan for each installation, including personnel staffing and skills, to accommodate expected site workload. CASS Station installations are carefully coordinated endeavors to ensure hardware, software, and skilled personnel are available to successfully activate each site. The Navy Training Plan describes CASS maintenance and training concepts in detail, lists billet training requirements by NEC/MOS for the next five years, and is synchronized with the CASS Implementation Plan to support the installation schedule with trained technicians. The cumulative effect of following both plans will ensure a skilled workforce is available to successfully support CASS implementation.

2. Subsidiary Research Questions

Does the NAMTRAGRUDET CASS curriculum address all equipment operation and maintenance requirements? Yes, the curriculum addresses all known operator and maintainer skill requirements. A CASS curriculum training task list was generated from contractor provided curriculum, technical publications, ATE instructor experience, and input from subject matter experts. An independent contractor, OC Incorporated, completed an analysis of the training tasks and produced a report that indicates the curriculum covers virtually 100% of all operator and maintainer requirements. The contractor also determined that the skills needed to operate and maintain CASS stations and supporting TPSs are the same skills needed to maintain other weapon system WRAs and SRAs.

Are formal training elements such as NAMTRAGRUDET instructor staffing, class schedules, and student quotas thoroughly addressed? Yes, the Navy Training Plan defines instructor staffing, class schedule and student throughput requirements. Staffing levels are determined by student training requirements and are adjusted according to the needs of the fleet. Semi-annual CASS Implementation Manpower Plan updates provide the NAMTRAGRUDETs with technician training requirements and facilitates accurate class planning.

Are training hardware/software elements such as CASS Station, Weapons Repairable Assemblies (WRAs), Shop Replaceable Assemblies (SRAs), and Test Program Sets (TPSs) in place or available? No, deliveries of these elements are not complete. The NAMTRGRUDETs do not have all required CASS Station hardware or CASS Station TPSs. There are also problems with the quantity and type of equipment. For example, the optical

reader, substituted for the CASS Station input/monitor device, is inadequate and does not provide the student with the same display or performance capability found on the actual input/monitor device. As a result the student learns to perform a series of procedures unrelated to input/monitor operation. This type of learning process is non-productive, does not efficiently utilize instructor or trainee time, and can cause confusion during actual operation of the CASS Station. In addition, both east and west coast CASS training facilities need to add several CASS Stations and related hardware to support training demands through the year 2003. Aircraft specific WRAs and SRAs, strongly desired by the training staff for hands-on training, are promised for delivery when they become available, but an expected delivery or availability date is unknown.

Has a Maintenance Training Improvement Program (MTIP) support package been developed for fleet workcenter training? No, but NAMTRAGRUDET Miramar is in the process of developing a MTIP question and answer bank. Before MTIP can be implemented for workcenter training, additional effort is required to refine the data base, produce tests, and develop supporting lesson guides. A workcenter training program should complement the formal NAMTRAGRUDET curriculum. MTIP, as specified in the Navy Training Plan, is diagnostic in nature and intended to be an effective fleet training system. Therefore, CASS MTIP must be carefully constructed to accurately assess technician skills, provide the required remedial training, and be continuously updated to reflect current fleet CASS configurations. The thesis author is of the opinion that even if CASS MTIP is adequately designed and maintained, its value for ATE applications is marginal. The very nature of intermediate level maintenance requires a technician to perform a specific WRA or SRA

maintenance task. If the technician cannot perform the task, the specific skill deficiency is identified. Thus, task completion and remedial training take place at the same time. The author concludes that a CASS MTIP does not provide any additional diagnostic/remedial training benefits, but instead results in an unnecessary administrative burden. In its present state, or even after it is fully developed, MTIP will not significantly improve technician capability.

Will Engineering Technical Services (ETS) be available for fleet support? Yes, support is currently available. Naval Engineering Support Unit (NAESU) personnel provide engineering technical services in support of CASS. Miramar NAESU representatives completed training in 1995 and are available to support fleet technician training in the workcenter. As the number of CASS installations and technicians increases, NAESU support will expand to cover the requirements.

B. RECOMMENDATIONS

The following recommendations are made based on the above conclusions:

1. NAVAIR should actively solicit feedback from fleet CASS workcenters to determine overall training program effectiveness. Independent studies by DOD contractors can pin point missing curriculum items but can not provide a complete evaluation of training program quality. Training shortfalls should be addressed prior to the periodic MTRRs so that the process can better focus on problem discussion and resolution.

2. Deliveries of required CASS Station equipment, WRAs, SRAs, and TPSs must be expedited. The basic operator/maintainer course must be supported with the essential elements to teach station operation and maintenance. NAVAIR should increase efforts to obtain aircraft-specific WRAs, SRAs, and TPSs for student training. A representative sample of these assets, as described in the CIP and detailed in the OC Incorporated report, would enhance training and satisfy the desire for hands-on experience.

C. FOLLOW ON RESEARCH

This thesis reviewed the current state of CASS human resource development. Because CASS is relatively new, training support has been defined but is as yet incomplete. As more WRAs/SRAs transition to CASS, additional research will be needed to monitor and verify the quality and sufficiency of technician training. Although the training program appears effective at this time and is producing the desired result, emerging CASS-supported weapon system requirements may reveal training deficiencies. The ongoing issue of aircraft specific WRA, SRA, and TPS training requires further review to accurately define the impact resulting from a lack of these assets.

APPENDIX

This appendix presents personnel and training support requirements for fiscal years 1995-1999. Table 2 lists total new fleet and fleet support billets by rating, NEC, and MOS. Table 3 shows instructor and support personnel billets at the NAMTRAGRUDET Oceana (Oceana Naval Air Station, Norfolk, Va.) and NAMTRAGRUDET Miramar (Miramar Naval Air Station, San Diego, Ca.). Net incremental and cumulative billet increases and decreases are listed on Table 4. Total annual training input requirements to attain and sustain fleet, fleet support, industrial, foreign, non-military, reserve, instructor, and support requirements for each course are found on Table 5.

	DESIG/ RATING	PNEC/ PMOS	SNEC/ SMOS	FY95 OFF	FY95 ENL	FY96 OFF	FY96 ENL	FY97 OFF	FY97 ENL	FY98 OFF	FY98 ENL	FY99 OFF	FY99 ENL
MAINTENANCE													
USN Fleet													
TAR	AT/ET	6704		0	1	0	2	0	14	0	4	0	0
	AT/ET	6705		0	0	0	0	0	6	0	2	0	0
USMC Fleet													
USMC		6467		0	6	0	0	0	12	0	0	0	0
TOTAL:				0	7	0	2	0	32	0	6	0	0
USN Fleet Support													
ACDU	AT/ET*	6704		0	104	0	103	0	116	0	54	0	28
	AT/ET*	6705		0	16	0	10	0	14	0	14	0	16
USMC Fleet Support		6467		0	7	0	4	0	22	0	52	0	33
TOTAL:				0	127	0	117	0	152	0	120	0	77
USN FLEET TOTAL:				0	1	0	2	0	20	0	6	0	0
USN FLEET SUPPORT TOTAL:				0	120	0	113	0	130	0	68	0	44
USN GRAND TOTAL:				0	121	0	115	0	150	0	74	0	44
USMC FLEET TOTAL:				0	6	0	0	0	12	0	0	0	0
USMC FLEET SUPPORT TOTAL:				0	7	0	4	0	22	0	52	0	33
USMC GRAND TOTAL:				0	13	0	4	0	34	0	52	0	33

Table 2. total New Fleet and Fleet Support Billets by Rating, NEC, and MOS. From Ref. [2].

SCHOOL/ LOCATION/ UIC	REQUIRED ON BOARD DATE	OPER/ AIRCREW COURSE OFF	ENL	MAINT COURSE OFF	ENL	OPER & MAINT COURSE OFF	ENL	TEAM COURSE OFF	ENL	SUPPORT PERSONNEL OFF	ENL	ACDU/ TAR/ SELRES	DESIG/ RATING	PNEC/ PMOS	SNEC/ SMOS
MTU 3010/	Jun 93	0	0	0	2*	0	0	0	0	0	0	ACDU	AT2	6704	9502
NAMTGD Oceana/	Jun 93	0	0	0	1*	0	0	0	0	0	0	ACDU	AT2	6705	9502
66045	Aug 92	0	0	0	3*	0	0	0	0	0	0	ACDU	AT1	6704	9502
	Aug 92	0	0	0	3*	0	0	0	0	0	0	ACDU	AT1	6705	9502
	Aug 94	0	0	0	1*	0	0	0	0	0	0	ACDU	ATC	0000	9502
	Oct 95	0	0	0	1*	0	0	0	0	0	0	USMC		6467	
	Oct 96	0	0	0	1*	0	0	0	0	0	0	ACDU	AT1	6704	9502
	Oct 96	0	0	0	1*	0	0	0	0	0	0	ACDU	ATC	6705	9502
	Oct 96	0	0	0	1*	0	0	0	0	0	0	USMC		6467	
	Oct 97	0	0	0	1*	0	0	0	0	0	0	USMC		6467	
SUBTOTAL:		0	0	0	15	0	0	0	0	0	0				
MTU 3011/	Oct 93	0	0	0	3*	0	0	0	0	0	0	ACDU	AT1	6704	9502
NAMTGD Miramar/	Oct 93	0	0	0	3*	0	0	0	0	0	0	ACDU	AT1	6705	9502
66064	Oct 93	0	0	0	2*	0	0	0	0	0	0	ACDU	AT2	6704	9502
	Oct 93	0	0	0	1*	0	0	0	0	0	0	ACDU	AT2	6705	9502
	Oct 93	0	0	0	1*	0	0	0	0	0	0	ACDU	ATC	0000	9502
	Oct 95	0	0	0	1*	0	0	0	0	0	0	USMC		6467	
	Oct 96	0	0	0	1*	0	0	0	0	0	0	ACDU	AT1	6704	9502
	Oct 96	0	0	0	1*	0	0	0	0	0	0	ACDU	AT2	6704	9502
	Oct 96	0	0	0	1*	0	0	0	0	0	0	ACDU	ATC	6705	9502
	Oct 96	0	0	0	2*	0	0	0	0	0	0	USMC		6467	
SUBTOTAL:		0	0	0	16	0	0	0	0	0	0				
USN TOTAL:		0	0	0	25	0	0	0	0	0	0				
USMC TOTAL:		0	0	0	6	0	0	0	0	0	0				
GRAND TOTAL:		0	0	0	31	0	0	0	0	0	0				

NOTES: 1. * = Additional manpower

Table 3. total Number of Instructor and Support Personnel Required for Training Activities. From Ref. [2].

		BILLET BASE	FY95		FY96		FY97		FY98		FY99	
Enlisted(Navy)			+/-	CUM	+/-	CUM	+/-	CUM	+/-	CUM	+/-	CUM
Fleet Billets	ACDU/TAR	41	+ 0	41	0	41	-36	5	- 1	4	+ 0	4
	SELRES	13	+ 0	13	+ 0	13	- 12	1	+ 0	1	0	1
Fleet Support Billets	ACDU/TAR	753	+116	869	+ 43	912	-375	537	- 43	494	+ 44	538
	SELRES	18	+ 0	18	- 2	16	- 10	6	- 1	5	+ 0	5
Staff Billets (Instructor/Support)	ACDU/TAR	10	+ 10	20	+ 0	20	+ 5	25	+ 0	25	+ 0	25
Chargeable Student Billets	ACDU/TAR	9	+ 7	16	+ 0	16	+ 6	22	- 14	8	- 3	5
Enlisted(USMC)												
Fleet Billets	USMC	236	+ 6	242	+ 0	242	- 44	198	-155	43	0	43
Fleet Support Billets	USMC	0	+ 7	7	+ 4	11	+ 18	29	+ 47	76	+ 33	109
Staff Billets (Instructor/Support)	USMC	0	+ 0	0	+ 2	2	+ 3	5	+ 1	6	+ 0	6
Chargeable Student Billets	USMC	0	+ 2	2	+ 1	3	+ 5	8	+ 0	8	- 3	5

Table 4. Net Annual Incremental and Cumulative Billet Increases/Decreases - Navy. From Ref. [2].

COURSE/ TYPE OF TRAINING	SOURCE OF REQUIREMENT	ACDU/ TAR/ SELRES	PNEC/ PMOS	SNEC/ SMOS	FY95 OFF	FY95 ENL	FY96 OFF	FY96 ENL	FY97 OFF	FY97 ENL	FY98 OFF	FY98 ENL	FY99 OFF	FY99 ENL
MAINTENANCE														
198-6101	Fleet and Fleet	ACDU	6705		0	17	0	10	0	15	0	15	0	17
CASS Calibration/	Support	ACDU	6705	9502	0	4	0	4	0	4	0	4	0	4
Advanced		TAR	6705		0	0	0	0	0	6	0	2	0	0
Maintenance Technician														
198-6102	Fleet and Fleet	ACDU	6704		0	96	0	95	0	107	0	50	0	26
CASS Operator/	Support	ACDU	6704	9502	0	4	0	5	0	4	0	4	0	5
Maintainer		TAR	6704		0	1	0	2	0	14	0	4	0	0
198-6103	Fleet and Fleet	USMC	6467		0	11	0	3	0	28	0	42	0	27
CASS Test Station	Support	USMC	6467		0	2	0	2	0	2	0	2	0	2
Intermediate Operator/Maintainer Technician														
198-3043/	Fleet and Fleet	ACDU	6705		0	0	0	0	0	2	0	0	0	0
CASS Calibration/	Support	USMC	6467		0	0	0	2	0	3	0	1	0	0
Maintenance		Industrial			0	16	0	22	0	21	0	21	0	21
Technician (Part of Track 198-6101)														

Table 5. Total Annual Training Input Requirements To Attain and Sustain all CASS Requirements. From Ref. [2].

COURSE/ TYPE OF TRAINING	SOURCE OF REQUIREMENT	ACDU/ TAR/ SELRES	PNEC/ PMOS	SNEC/ SMOS	FY95 OFF	FY95 ENL	FY96 OFF	FY96 ENL	FY97 OFF	FY97 ENL	FY98 OFF	FY98 ENL	FY99 OFF	FY99 ENL
MAINTENANCE (Continued)														
198-3044/ CASS Intermediate Operator/Maintainer Course (Part of Track 198-6102)	Fleet and Fleet Support	ACDU	6704		0	16	0	16	0	34	0	0	0	0
		USMC	6467		0	0	0	2	0	3	0	1	0	0
		Industrial			0	31	0	37	0	34	0	34	0	34
		USN TOTAL:			0	138	0	132	0	186	0	79	0	52
		USMC TOTAL:			0	13	0	9	0	36	0	46	0	29
		OTHER TOTAL:			0	47	0	59	0	55	0	55	0	55
		GRAND TOTAL:			0	198	0	200	0	277	0	180	0	136

Table 5. Total Annual Training Input Requirements To Attain and Sustain all CASS Requirements. From Ref. [2].

FOREIGN/OTHER NON-MILITARY	CIN/ COURSE	TYPE OF TRAINING	FY95	FY96	FY97	FY98	FY99
NADEP/NWS/WQEC	C-198-3044/ CASS Test Station Operator-Maintainer Course	Maintenance	31	37	34	34	34
NADEP/NWS/WQEC	C-198-3043/ CASS Intermediate Maintenance Course	Maintenance	16	22	21	21	21

Table 5. Total Annual Training Input Requirements To Attain and Sustain all CASS Requirements. From Ref. [2].

LIST OF REFERENCES

1. Commander, Naval Air Systems Command (PMA-260), *Consolidated Automated Support System (CASS) Implementation Plan*, March 1995.

2. Commander, Naval Aviation Maintenance Office, *Proposed Navy Training Plan for the AN/USM-636 (V) Consolidated Automated Support System*, June 1995.

3. Naval Air Warfare Center Aircraft Division Lakehurst, NJ., *Consolidated Automated Support System (CASS) Site Activation Planning Guide (SAPG) USS Dwight D.Eisenhower (CVN-69*, October 1995.

4. Chief of Naval Operations Instruction, *Naval Aviation Maintenance Program 4790.2f*, vol. 1, chapter 21, section 21.12, CD-ROM July 1995.

5. Benjamin S. Blanchard, *Logistics Engineering and Management*, pp 339, 379, 381, 382, Fourth Ed., Prentice Hall , Inc., 1992.

6. ATE Ad Hoc Working Group, *Report on Navy Issues Concerning Automatic Test, Monitoring and Diagnostic Systems and Equipment*, prepared for the Assistant Secretary of the Navy for Research and Development, 13 February 1976.

7. Chief of Naval Operations, *Navy Decision Coordinating Paper (NDCP) #W-0852-SL for Consolidated Automated Support System Test Equipment Program*, June 1986.

8. Chief of Naval Operations, *Operational Requirements Document for the Consolidated Automated Support System Program*, September 1991.

9. OC, Incorporated, *Training Situation Analysis Report*, April 1995.

10. OC, Incorporated, *Mission Collective Individual & Occupational-Training Task Analysis Report*, April 1995.

11. Freeburg W., Avionics Technician Chief Petty Officer, USN, Naval Aviation Maintenance Training Group Detachment Miramar (MTU 3011), interview conducted during site visit Novermber 13-15, 1995.

12. Maintenance Training Unit #3011, *Memorandum on C-198-3044A Lessons Impacted by Using the AN/UYK-105 Optical Reader*, August 1995.

13. NAMTRAGRUDET Miramar, *Training Deficiency Report (SOS TPS) 04-95 DTG. 061430Z*, November 1995.

14. Chief of Naval Education and Training, *NEC "C" School Input Plan Comments*, November 1995.

15. NAMTRAGRU Millington Tn., *Integrated Logistics Support Meeting Action Chit # TRG-007*, March 1992.

16. Olson, T.M., Avionics Technician Chief Petty Officer, USN, Aircraft Intermediate Maintenance Department Naval Air Station Miramar, site visit and interview conducted July 1995.

INITIAL DISTRIBUTION LIST

1.	Defense Technical Information Center 8725 John J. Kingman Rd., STE 0944 Ft. Belvoir, Virginia 22060-6218	2
2.	Library, Code 13 Naval Postgraduate School Monterey, California 93943-5101	2
3.	Prof. Paul J. Fields (Code SM/FP) Department of Systems Management Naval Postgraduate School Monterey, California 93943-5008	2
4.	Prof. Kevin R. Gue (Code SM/GK) Department of Systems Management Naval Postgraduate School Monterey, California 93943-5008	1
5.	Captain J.E. Derrick Commander, Naval Air Systems Command (PMA-260) Washington, D.C. 20361	1
6.	Lieutenant Commander George F. Kilian USS Lincoln (CVN-72) AIMD, IM1 Division FPO San Francisco, Ca. 96601	2
7.	Defense Logistic Studies Information Exchange U.S. Army Logistics Management College Fort Lee, Virginia 23801-6043	1